This listing of claims will replace all prior versions, and listings, of claims in the application:

1   Claim 1 (original): A method for use in a multi-stage
2   switch including
3   - a plurality of central modules, and
4   - a plurality of input modules, each including
5   virtual output queues and outgoing links coupled with
6   each of the plurality of central modules,
7   for scheduling the dispatch of cells stored in the virtual
8   output queues, the method comprising:
9   a) matching a non-empty virtual output queue of an
10   input module with an outgoing link in the input
11   module; and
12   b) matching the outgoing link with an outgoing link
13   of one of the central modules,
14   wherein high switch throughput can be achieved
15   without speedup of the central modules.

1   Claim 2 (original): The method of claim 1 wherein the act
2   of matching a non-empty virtual output queue of an input
3   module with an outgoing link in the input module includes:
4   i) broadcasting a request for the non-empty
5   virtual output queue to an arbiter for each of
6   the outgoing links of the input module;
7   ii) selecting, with the arbiter of each of the
8   outgoing links of the input module, a non-empty
9   virtual output queue that broadcast a request;
10   iii) sending a grant to an arbiter for the
11   selected non-empty virtual output queue; and
12   iv) selecting, with the arbiter of the selected
13   non-empty virtual output queue, an outgoing link

14   from among the one or more outgoing links that
15   sent a grant.

1   Claim 3 (original): The method of claim 2 wherein the act
2   of matching a non-empty virtual output queue of an input
3   module with an outgoing link in the input module occurs
4   within one cell time slot.

1   Claim 4 (original): The method of claim 2 wherein the act
2   of selecting, with the arbiter of each of the outgoing
3   links of the input module, a non-empty virtual output queue
4   that broadcast a request, is done in accordance with a
5   round robin discipline.

1   Claim 5 (currently amended): The method of claim 2 wherein
2   the act of selecting, with the arbiter of each of the
3   outgoing links of the input module, a non-empty virtual
4   output queue that broadcast a request, is done ~~in~~ based on
5   the location of a pointer updated in accordance with a
6   round robin discipline through each of the virtual output
7   queues of the input module.

1   Claim 6 (original): The method of claim 5 wherein the
2   pointer moves through groups of virtual output queues,
3   before moving through virtual output queues within each
4   group.

1   Claim 7 (original): The method of claim 2 wherein the acts
2   of

3   i) broadcasting a request for the non-empty
4   virtual output queue to an arbiter for each of
5   the outgoing links of the input module;
6   ii) selecting, with the arbiter of each of the
7   outgoing links of the input module, a non-empty
8   virtual output queue that broadcast a request;
9   iii) sending a grant to an arbiter for the
10   selected non-empty virtual output queue; and
11   iv) selecting, with the arbiter of the selected
12   non-empty virtual output queue, an outgoing link
13   from among the one or more outgoing links that
14   sent a grant,
15   are performed at least twice within one cell time slot.

1   Claim 8 (original): The method of claim 1 wherein the act
2   of matching the outgoing link of the input module with an
3   outgoing link of one of the central modules includes:

4   i) broadcasting a request for the outgoing link of the
5   input module to an arbiter for each of the outgoing links
6   of the central modules that lead towards an output port
7   associated with the virtual output queue matched with the
8   outgoing link of the input module;

9   ii) selecting with the arbiter of each of the outgoing
10   links of the central modules, an outgoing link of an
11   input module that broadcast a request; and

12   iii) sending a grant to the selected outgoing link of
13   the input module.

1   Claim 9 (original): The method of claim 8 wherein the act
2   of selecting with the arbiter of each of the outgoing links

4

3   of the central module, an outgoing link of the input module

4   that broadcast a request, is done based on a round robin

5   discipline.

1   Claim 10 (original): The method of claim 8 wherein the act

2   of selecting, with the arbiter of each of the outgoing

3   links of the central module, an outgoing link of the input

4   module that broadcast a request, is done in based on the

5   location of a pointer updated in accordance with a round

6   robin discipline through each of the outgoing links of each

7   of the input modules.

1   Claim 11 (original): A method for use in a multi-stage

2   switch including

3   - a plurality of central modules, and

4   - a plurality of input modules, each including

5   virtual output queues and outgoing links coupled with

6   each of the plurality of central modules,

7   for matching a non-empty virtual output queue of an input

8   module with an outgoing link in the input module, the

9   method comprising:

10   a)   broadcasting a request for the non-empty virtual

11   output queue to an arbiter for each of the outgoing

12   links of the input module;

13   b)   selecting, with the arbiter of each of the

14   outgoing links of the input module, a non-empty

15   virtual output queue that broadcast a request;

16   c)   sending a grant to an arbiter for the selected

17   non-empty virtual output queue; and

18   d) selecting, with the arbiter of the selected

19   non-empty virtual output queue, an outgoing link from

5

20   among the one or more outgoing links that sent a

21   grant.

1   Claim 12 (original): The method of claim 11 wherein the

2   act of matching a non-empty virtual output queue of an

3   input module with an outgoing link in the input module

4   occurs within one cell time slot.

1   Claim 13 (original): The method of claim 11 wherein the

2   act of selecting, with the arbiter of each of the outgoing

3   links of the input module, a non-empty virtual output queue

4   that broadcast a request, is done in accordance with a

5   round robin discipline.

1   Claim 14 (original): The method of claim 11 wherein the

2   act of selecting, with the arbiter of each of the outgoing

3   links of the input module, a non-empty virtual output queue

4   that broadcast a request, is done in based on the location

5   of a pointer updated in accordance with a round robin

6   discipline through each of the virtual output queues of the

7   input module.

1   Claim 15 (original): The method of claim 14 wherein the

2   pointer moves through groups of virtual output queues,

3   before moving through virtual output queues within each

4   group.

1   Claim 16 (original): The method of claim 11 wherein the

2   acts of

3   a) broadcasting a request for the non-empty virtual

4   output queue to an arbiter for each of the outgoing

5   links of the input module;

6   b) selecting, with the arbiter of each of the

7   outgoing links of the input module, a non-empty

8   virtual output queue that broadcast a request;

9   c) sending a grant to an arbiter for the selected

10   non-empty virtual output queue; and

11   d) selecting, with the arbiter of the selected

12   non-empty virtual output queue, an outgoing link from

13   among the one or more outgoing links that sent a

14   grant,

15 are performed at least twice within one cell time slot.

1 Claim 17 (previously presented): A combination for use in

2 a multi-stage switch, the combination comprising:

3   a) a plurality of central modules, each including

4   outgoing links towards output modules including a

5   plurality of output ports;

6   b) a plurality of input modules, each including

7   i) virtual output queues, and

8   ii) outgoing links coupled with each of the

9   plurality of central modules; and

10   c) means for matching a non-empty virtual output

11   queue of the input module with an outgoing link in the

12   input module; and

13   d) means for matching the outgoing link of the input

14   module with an outgoing link of one of the central

15   modules,

16   wherein high switch throughput can be achieved

17 without speedup of the central modules.

1 Claim 18 (original): The combination of claim 17 wherein
2 the means for matching a non-empty virtual output queue of
3 an input module with an outgoing link in the input module
4 include:
5   i) means for broadcasting a request for the
6   non-empty virtual output queue to an arbiter for
7   each of the outgoing links of the input module;
8   ii) for each of the outgoing links of the input
9   module, an arbiter for selecting a non-empty
10   virtual output queue that broadcast a request;
11   iii) means for sending a grant to an arbiter for
12   the selected non-empty virtual output queue; and
13   iv) for the selected non-empty virtual output
14   queue, an arbiter for selecting an outgoing link
15   from among the one or more outgoing links that
16   sent a grant.

1 Claim 19 (original): The combination of claim 18 wherein
2 the means for matching a non-empty virtual output queue of
3 an input module with an outgoing link in the input module
4 performs the match within one cell time slot.

1 Claim 20 (original): The combination of claim 18 wherein
2 the arbiter of each of the outgoing links of the input
3 module for selecting a non-empty virtual output queue that
4 broadcast a request, includes a pointer updated in
5 accordance with a round robin discipline.

1 Claim 21 (original): The combination of claim 20 wherein
2 the pointer moves through groups of virtual output queues,
3 before moving through virtual output queues within each
4 group.

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1 Claim 22 (original): The combination of claim 17 wherein
2 the means for matching a non-empty virtual output queue of
3 the input module with an outgoing link in the input module
4 performs multiple matching iterations within one cell time
5 slot.

1 Claim 23 (original): The combination of claim 17 wherein
2 the means for matching the outgoing link with an outgoing
3 link of one of the central modules include:
4   i) means for broadcasting a request for the outgoing
5   link of the input module to an arbiter for each of the
6   outgoing links of the central modules that lead towards
7   an output port associated with the virtual output queue
8   matched with the outgoing link of the input module;
9   ii) for each of the outgoing links of the central
10   module, an arbiter for selecting an outgoing link of the
11   input module that broadcast a request; and
12   iii) means for sending a grant to the selected outgoing
13   link of the input module.

1 Claim 24 (original): The combination of claim 23 wherein
2 the arbiter of each of the outgoing links of the central
3 module for selecting an outgoing link that broadcast a
4 request, includes a pointer updated based on a round robin
5 discipline.

1 Claim 25 (original): The combination of claim 17 wherein
2 there are:

3   k input modules, each having n input ports, n x k
4   virtual output queues, and m outgoing links.

1   Claim 26 (original): The combination of claim 25 wherein,
2   n x k virtual output queues of each input module are
3   grouped into k groups of n virtual output queues.

1   Claim 27 (original): An input module for use a multi-stage
2   switch including a plurality of central modules, the input
3   module comprising:
4   a)   virtual output queues;
5   b)   outgoing links coupled with each of the plurality
6   of central modules; and
7   c)   means for matching a non-empty virtual output
8   queue of an input module with an outgoing link in the
9   input module, the means for matching including
10   i)   means for broadcasting a request for the non-empty
11   virtual output queue to an arbiter for each of the
12   outgoing links of the input module,
13   ii)   for each of the outgoing links of the input module,
14   an arbiter for selecting a non-empty virtual output queue
15   that broadcast a request,
16   iii)   means for sending a grant to an arbiter for the
17   selected non-empty virtual output queue, and
18   iv)   for the selected non-empty virtual output
19   queue, an arbiter for selecting an outgoing link
20   from among the one or more outgoing links that
21   sent a grant.

1   Claim 28 (original): The input module of claim 27 wherein
2   the means for matching a non-empty virtual output queue of

10

3 an input module with an outgoing link in the input module

4 performs such matching within one cell time slot.

1 Claim 29 (original): The input module of claim 27 wherein

2 the arbiter of each of the outgoing links of the input

3 module for selecting a non-empty virtual output queue that

4 broadcast a request, is pointer updated in accordance with

5 a round robin discipline.

1 Claim 30 (original): The input module of claim 29 wherein

2 the pointer moves through groups of virtual output queues,

3 before moving through virtual output queues within each

4 group.

1 Claim 31 (original): The input module of claim 27 wherein

2 means for matching a non-empty virtual output queue of an

3 input module with an outgoing link in the input module

4 repeats such matching within one cell time slot.

1 Claim 32 (original): The input module of claim 27 wherein

2 there are k input modules, each having n input ports, n x k

3 virtual output queues, and m outgoing links.

1 Claim 33 (original): The input module of claim 32 wherein

2 the n x k virtual output queues of each input module are

3 grouped into k groups of n virtual output queues.

Claim 34 (canceled)

1 Claim 35 (previously presented): The method of claim 1

2 wherein each of the outgoing links of the input module is

3   associated with an arbiter dedicated to the particular

4   outgoing link.